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(54)【発明の名称】 多原色表示用原色変換方法

(57)【要約】
【目的】 カラーテレビジョン伝送方式において，3原色表示用の信号を3原色を越える多原色表示用の信号に簡単な方法で変換する。
【構成】 伝送されたきた3原色R，G，B信号が色度図上いかなる位置にあるかを判定し，その結果により変換される3原色を越える多原色の中から3つの色を選び，公知の方法でそれらの1次結合を作成したり，変換される3原色を越える多原色信号を3原色R，G，B信号の1次結合としてすべて計算して出力し、このとき、多原色中から3つの色を選択し、それ以外の色の出力が負になる時にはその出力を零にするとともに補正信号を用意し、前記選択された3つの原色の1次結合の出力にその補正信号を加算して出力するように構成する。

【特許請求の範囲】

【請求項1】　伝送されてきたカラーテレビジョン信号の輝度信号Yと2つの色差信号C_1およびC_2を、逆マトリクス回路を介して3原色信号R、G及びBに変換し、変換により得られた3原色信号R、GおよびBが色度図上いかなる位置にあるかを判定し、その判定結果に基づき別に色度図上で設けた3原色を越える多原色の中から3つの原色を選択し、これらの1次結合により入力色信号を表わし、受信側での多原色表示に備えるようにしたことを特徴とする多原色表示用原色変換方法。

【請求項2】　伝送されてきたカラーテレビジョン信号の輝度信号Yと2つの色差信号C_1およびC_2を、逆マトリクス回路を介して3原色信号R、GおよびBに変換し、受信側で別に色度図上で設けた3原色を越える多原色信号をそれぞれ前記3原色信号R、GおよびBの1次結合として計算して出力し、前記3原色を越える多原色の中から3つの原色を選択し、それ以外の原色の前記1次結合の出力が負になる時にはその出力を零にするとともに補正信号を用意し、前記選択された3つの原色の前記1次結合の出力にその補正信号を加算して出力し、受信側での多原色表示に備えるようにしたことを特徴とする多原色表示用原色変換方法。

【請求項3】　前記カラーテレビジョン信号が受信側表示装置のガンマ補正をみこんで逆ガンマ補正されて伝送される場合には、原色変換に先き立ち3原色信号R、GおよびBをそれぞれガンマ補正し、出力多原色信号を逆ガンマ補正することを特徴とする請求項1または2記載の多原色表示用原色変換方法。

【発明の詳細な説明】

【0001】

【産業上の利用分野】この発明は、テレビジョン信号を表示するための信号処理回路に係り、特に簡易な1次結合と負信号のクリップとを用いて3原色方式になるカラーテレビジョン信号を多原色表示用の信号へ変換する原色変換方法に関するものである。

【0002】

【従来の技術】現行のカラーテレビジョン伝送方式あるいはその表示装置においては、3原色からの伝送あるいは3原色にもとづいた表示が実用化されており、3原色を越える多原色表示の従来技術は存在しなかった。

【0003】

【発明が解決しようとする課題】例えば現行のカラーテレビジョン標準方式は3つの原色点、即ち赤（R）、緑（G）および青（B）から成り立っている。xy色度図上にこれらの原色点を表示すると例えば図7のようになる。現行の標準方式は図7の3角形RGBの外側にある色も表現することが可能であり、任意の色を3原色点R、GおよびBの信号レベルr、gおよびbにより表現すれば、点Aはrの値が負になる色である。

【0004】しかし受像機側においてはレベルが負の値に相当する発光色は存在しないため、3原色点が受信側と送信側とで等しければ、色度図上の点Aのような3角形の外側に位置する色は正しく再現できないことになる。これを改善する方法として次の2つの方法が考えられる。

（i）受像機側で彩度の高い色を3原色点とする。

（ii）彩度の高い色を加えて、より多原色の受像機とする。

（i）の方法で広い色範囲を再現しようとすると、非常に彩度の高い色を用いる必要があり、通常彩度の高い色は輝度が低いことから（ii）の方法の方が実用上有利である。

【0005】今一例として図8のような6原色表示を考える。新しい原色はO、P、Q、S、T、Uである。6原色を考えたのは、現行の表示が3原色なので、これの整数倍とすることが実用上容易と考えられるからである。6原色各色の信号レベルがそれぞれo、p、q、s、t、uである色を、3原色システムで表現したときに3原色各色の信号レベルがそれぞれr、g、bであるならば、R、G、B、O、P、Q、S、T、Uを1×3のマトリクスとして（要素は光の3刺激値）、式（1）が成立する。

【数1】

$$o \cdot O + p \cdot P + q \cdot Q + s \cdot S + t \cdot T + u \cdot U = r \cdot R + g \cdot G + b \cdot B \qquad (1)$$

式（1）は6元3連立方程式であるから何か条件を付加しなければ解くことはできない。

【0006】そこで本発明の目的は、伝送されてきた3原色方式になるカラーテレビジョン信号を多原色表示用の信号に変換して、彩度の高い色も正確に再現することの可能な、より具体的には前述の式（1）のような6元3連立方程式を解くことの可能な多原色表示用原色変換方法を提供せんとするものである。

【0007】

【課題を解決するための手段】その目的を達成するため、本発明多原色表示用原色変換方法になる第1の発明は、伝送されてきたカラーテレビジョン信号の輝度信号Yと2つの色差信号C_1およびC_2を、逆マトリクス回路を介して3原色信号R、G及びBに変換し、変換により得られた3原色信号R、GおよびBが色度図上いかなる位置にあるかを判定し、その判定結果に基づき別に色度図上で設けた3原色を越える多原色の中から3つの原色を選択し、これらの1次結合により入力色信号を表わし、受信側での多原色表示に備えるようにしたことを特徴とするものである。

【0008】またその第2の発明は、伝送されてきたカラーテレビジョン信号の輝度信号Yと2つの色差信号C_1およびC_2を、逆マトリクス回路を介して3原色信号R、GおよびBに変換し、受信側で別に色度図上で設けた3原色を越える多原色信号をそれぞれ前記3原色信号

R．GおよびBの１次結合として計算して出力し，前記３原色を越える多原色の中から３つの原色を選択し、それ以外の原色の前記１次結合の出力が負になる時にはその出力を零にするとともに補正信号を用意し、前記選択された３つの原色の前記１次結合の出力にその補正信号を加算して出力し、受信側での多原色を表示に備えるようにしたことを特徴とするものである。

【０００９】

【実施例】以下添付図面を参照し実施例により本発明を詳細に説明する。まず伝送されたきた３原色方式になるカラーテレビジョン信号の輝度信号Ｙおよび２つの色差信号C_1,C_2は通常の逆マトリクス回路により３原色信号Ｒ．Ｇ及びＢに変換される。この３原色信号をその入力の色に応じて，画素毎に，受信側にて３原色以上の原色点間で原色点を切り替える方法が本願の第１の発明である。

【００１０】図２に６原色表示で、うち３原色の組合せで表示の可能な４つの領域（３角形ＯＰＱ，ＰＳＱ，ＴＯＱ，ＴＱＵ）に色範囲を分けた第１の実施例である。例えば入力色信号が色度図上３角形ＯＰＱの範囲にあるならば、式（１）に於いてｓ＝ｔ＝ｕ＝0.0とした時＊ｏ，ｐ及びｑ＞0.0という解が得られるので正確な色再現が行われる。ｒ，ｇ，ｂからｏ，ｐ，ｑ，ｓ，ｔ，ｕへの変換は，図１図示のハードウェアの構成で実施することができる。

【００１１】図１で３原色Ｒ，Ｇ及びＢ信号の入力レベルがｒ′，ｇ′，ｂ′とあるのは，表示側の表示装置のガンマ特性が補正された色信号のＲ．Ｇ，Ｂの色成分を示すもので、ガンマ特性γでその補正を戻し，原色変換を行った後表示装置へ出力する前にガンマ特性補正をしている。判定器１は入力された色信号が色度図上，例えばｘｙ色度図上いかなる位置にあるか，例えば先に示した４つの３角形領域のどの領域にあるかを判定するもので，その判定の結果により縦に並んだ３つの係数器ｋの組（６組）のどの組を使用するのか使用しないのかを選択する。

【００１２】色度図上において、任意の色が与えられた直線のどちら側にあるかは，例えば図２図示ｘｙ色度図上において直線ＰＱの左にあるのか右にあるのかを調べるためには、色度図上直線ＰＱを表示する式（２）

【数２】

$$k_1 \cdot r + k_2 \cdot g + k_3 \cdot b = 0 \qquad (2)$$

より係数k_1,k_2,k_3を定め、これらの係数を入力色信号のｒ，ｇ，ｂ成分にそれぞれ乗じてそれらの１次結合をとり、結合の結果の正負により判定を行うものである。この判定のハード構成は図３のような構成で，図３の構成はとりもなおさず図１図示判定器１の中味である。

【００１３】すなわち図３において信号ｒ，ｇ，ｂは入力テレビジョン信号のＲ．Ｇ及びＢ成分にガンマ係数を乗じて戻した信号、係数k_1,k_2,k_3の係数の組は、図２図示色度図上で例えば直線ＰＱに対しいずれの側に入力色信号が存するかを判定するための乗算係数群，同様に係数k_4,k_5,k_6の係数の組および係数k_7,k_8,k_9※の係数の組は直線ＯＱおよびＱＴに対するもの，今の場合係数k_{10}，k_{11}，k_{12}の係数の組は使用されない組ということになる，

【００１４】これら係数の組の各乗算出力の１次結合はその正，負により判定器２～５で０又は１と判定され、それら出力は図１図示の係数器群ｋを作動させたり作動させなかったりして、より具体的には以下（ａ）から（ｄ）に示す動作をする。

【００１５】（ａ）入力の色が直線ＰＱの左の時
３角形ＰＳＱと判断し、係数器ｋは

【数３】

$$o = t = u = 0.0$$
$$p \cdot P + q \cdot Q + s \cdot S = r \cdot R + g \cdot G + b \cdot B \qquad (3)$$

で決まる係数になる。

【００１６】（ｂ）入力の色が直線ＰＱの右で直線ＯＱの上の時★３角形ＯＰＱと判断し、係数器ｋは

【数４】

$$s = t = u = 0.0$$
$$o \cdot O + p \cdot P + q \cdot Q = r \cdot R + g \cdot G + b \cdot B \qquad (4)$$

で決まる係数になる。

【００１７】（ｃ）入力の色が直線ＯＱの下で直線ＱＴの上の時☆３角形ＯＱＴと判断し、係数器ｋは

【数５】

$$p = s = u = 0.0$$
$$o \cdot O + q \cdot Q + t \cdot T = r \cdot R + g \cdot G + b \cdot B \qquad (5)$$

で決まる係数になる。

【００１８】（ｄ）入力の色が直線ＱＴの下の時◆３角形ＴＱＵと判断し、係数器ｋは

【数６】

$$o = p = s = 0.0$$
$$t \cdot T + q \cdot Q + u \cdot U = r \cdot R + g \cdot G + b \cdot B \qquad (6)$$

で決まる係数になる。

【0019】次に本願第2の発明に係る第2の実施例について説明する。図4にその第2の実施例の構成を示す。第1の実施例は入力の色に対応して1画素ごとに係数器kを取り変えるためハードウェアの規模が大きくなるが、図4では係数を一定としているためハードウェアの規模は小さい。この構成では、6角形OPSQUTのなかの一部の色が完全には再現されない場合もあるが、実用上全く問題はない。

【0020】この図で、負クリップ及び反転出力N．＊C．は以下の働きをするものである。すなわち入力x（図の左側）が正の時、右側に ″x″ を出力し、下には ″0″ を出力する。

【0021】入力xが負の時、右側に ″0″ を出力し、下には ″x″ を出力する。

【0022】以下に図4の原理的な動作を説明する。式（1）は、式（7）と変形できこれはs，t，uを従属変数として未知数がo，p，qの3元3連立方程式である。

【数7】

$$o \cdot O + p \cdot P + q \cdot Q = r \cdot R + g \cdot G + b \cdot B - s \cdot S - t \cdot T - u \cdot U \qquad (7)$$

【0023】s，t，uを単純にr，g，bの1次結合で表現すると、式（7）の制約により、原理的にはo，p，q，s，t，uすべての値が0または正で表現できる筈の6角形OPSQUTの内側の多くの色に対して、どれかの値が負になる。従って、正しい色再現ができない。図4ではこれを改善するため、負クリップ及び反転出力N．C．を用いている。この回路は、s，t，uが負の時は ″0″ を出力しその補正項をo，p，qに加えるもので、上記の問題を大幅に改善できる。

【0024】なお図の係数器kの係数は、6角形OPSQUT内部のほとんどの色に対してo，p，q，s，※t，uすべての値が0または正になるようにあらかじめ計算で決めておく。

【0025】また図5は、図4を4原色へ応用した場合のハード構成を示している。

【0026】次に本願発明をより具体的に理解するために、R，G，B，O，P，Q，S，T，Uに具体的に色度図上の数値を与えて図1と図4図示ハード構成の説明をする。例として、以下の色度点の場合について考察する。

【数8】

$$\begin{aligned}&R(0.393,\ 0.212,\ 0.019),G(0.365,\ 0.701,\ 0.112),B(0.192,\ 0.087,\ 0.958),\\&O(0.640,\ 0.360,\ 0.000),P(0.332,\ 0.620,\ 0.048),Q(0.153,\ 0.024,\ 0.823),\\&S(0.028,\ 0.398,\ 0.574),T(0.705,\ 0.295,\ 0.009),U(0.169,\ 0.007,\ 0.824)\end{aligned} \qquad (8)$$

【0027】式（8）で各原色は色の三刺激値X，Y，Zで表示され、xy色度図上で示せば図6のようになる。

【0028】入力された色r，g，bに対して、実施例1（図1）では、以下のように領域判定され信号レベル★が計算される。

（a）$-0.7949 \cdot r + 0.0569 \cdot g + 0.0487 \cdot b > 0.0$ のとき

【数9】

$$\begin{aligned}o &= t = u = 0.0\\p &= \ \ 0.9623 \cdot r + 1.0837 \cdot g + 0.0568 \cdot b\\q &= \ \ 0.6681 \cdot r + 0.0226 \cdot g + 1.1182 \cdot b\\s &= -1.0057 \cdot r + 0.0719 \cdot g + 0.0617 \cdot b\end{aligned} \qquad (9)$$

【0029】（b）$-0.7949 \cdot r + 0.0569 \cdot g + 0.0487 \cdot b < 0.0$ かつ $-0.0082 \cdot r + 0.5452 \cdot g + 0.0552 \cdot b$ ☆ > 0.0 のとき

【数10】

$$\begin{aligned}s &= t = u = 0.0\\o &= \ \ 0.6182 \cdot r - 0.0442 \cdot g - 0.0378 \cdot b\\p &= -0.0173 \cdot r + 1.1538 \cdot g + 0.1168 \cdot b\\q &= \ \ 0.0238 \cdot r + 0.0687 \cdot g + 1.1577 \cdot b\end{aligned} \qquad (10)$$

【0030】（c）$-0.0082 \cdot r + 0.5452 \cdot g + 0.0552 \cdot b < 0.0$ かつ $0.0511 \cdot r + 0.5820 \cdot g + 0.0557 \cdot b >$ ◆ 0.0 のとき

【数11】

$$\begin{aligned}p &= s = u = 0.0\\o &= \ \ 0.5274 \cdot r + 6.0651 \cdot g + 0.5745 \cdot b\\q &= \ \ 0.0228 \cdot r + 0.1360 \cdot g + 1.1645 \cdot b\\t &= \ \ 0.0745 \cdot r - 4.9629 \cdot g - 0.5023 \cdot b\end{aligned} \qquad (11)$$

【0031】（d）$0.0511 \cdot r + 0.5820 \cdot g + 0.0557 \cdot b < 0.0$ のとき

【数12】

$$o = p = s = 0.0$$

$q = 2.0815 \cdot r + 23.579 \cdot g + 3.4070 \cdot b$
$t = 0.5994 \cdot r + 1.0138 \cdot g + 0.0694 \cdot b$
$u = -2.0562 \cdot r - 23.414 \cdot b - 2.2398 \cdot b$

【0032】実施例2（図4）では、以下の計算が行われる。

【数13】

$$f(x) = \begin{cases} x, & x > 0.0 \\ 0, & x < 0.0 \end{cases}$$

$$g(x) = \begin{cases} 0, & x > 0.0 \\ x, & x < 0.0 \end{cases}$$

$$s_1 = -0.9182 \cdot r + 0.0825 \cdot g + 0.1979 \cdot b$$
$$t_1 = 0.2936 \cdot r - 1.8853 \cdot g - 0.3339 \cdot b$$
$$u_1 = -0.1249 \cdot r - 1.3786 \cdot g + 0.7049 \cdot b$$

としたとき

$$o = -0.2972 \cdot r + 2.3798 \cdot g + 0.4522 \cdot b - 0.6147 \cdot g(s_1) + 1.2189 \cdot g(t_1) + 0.0547 \cdot g(u_1)$$
$$p = 0.9378 \cdot r + 0.5533 \cdot g - 0.1118 \cdot b + 0.9741 \cdot g(s_1) - 0.2325 \cdot g(t_1) - 0.0593 \cdot g(u_1)$$
$$q = 0.7335 \cdot r + 1.4264 \cdot g + 0.3273 \cdot b + 0.6405 \cdot g(s_1) + 0.0136 \cdot g(t_1) + 1.0047 \cdot g(u_1)$$
$$s = f(s_1)$$
$$t = f(t_1)$$
$$u = f(u_1) \qquad (13)$$

【0033】いくつかの色サンプルについて、（9）～(13)式がどのような値を生じるのかを説明する。

（e）$r=-0.5$，$g=1.0$，$b=1.0$ は場合（図6のC1）

【0034】実施例1では $-0.7949 \cdot r + 0.0569 \cdot g + 0.0487 \cdot b = 0.503 > 0.0$ となるため（a）と判定され、式（9）より

【数14】

$$o=0.0,\ p=0.659,\ q=0.807,\ s=0.637,\ t=0.0,\ u=0.0 \qquad (14)$$

【0035】実施例2では $s_1=0.740$，$t_1=-2.357$，$u=-0.637$ より

【数15】

$$o=0.062,\ p=0.559,\ q=0.741,\ s=0.740,\ t=0.0,\ u=0.0 \qquad (15)$$

（f）$r=1.0$，$g=1.0$，$b=1.0$ の場合（図6のC2）

【0036】実施例1では $-0.7949 \cdot r + 0.0569 \cdot g + 0.0487 \cdot b = -0.689 < 0.0$　$-0.0082 \cdot r + 0.5452 \cdot g + 0.0552 \cdot b = 0.592 > 0.0$ となるため（b）と判定され式(10)より

【数16】

$$o=0.536,\ p=1.253,\ q=1.250,\ s=0.0,\ t=0.0,\ u=0.0 \qquad (16)$$

【0037】実施例2では $s_1=-0.538$，$t_1=-1.925$，$u=-0.799$ より

【数17】

$$o=0.536,\ p=1.253,\ q=1.250,\ s=0.0,\ t=0.0,\ u=0.0 \qquad (17)$$

（g）$r=1.0$，$g=-0.05$，$b=1.0$ の場合（図6のC3）

【0038】実施例1では $-0.0082 \cdot r + 0.5452 \cdot g + 0.0552 \cdot b = -0.030 < 0.0$　$0.0511 \cdot r + 0.5820 \cdot g + 0.0557 \cdot b = 0.028 > 0.0$ となるため（c）と判定され式(11)より

【数18】

$$o=0.285,\ p=0.0,\ q=0.132,\ s=0.0,\ t=0.272,\ u=0.0 \qquad (18)$$

【0039】実施例2では $s_1=-0.903$，$t_1=0.355$，$u_1=0.015$ より

【数19】

$$o=0.184,\ p=0.020,\ q=0.117,\ s=0.0,\ t=0.355,\ u=0.015 \qquad (19)$$

（h）$r=0.2$，$g=-0.14$，$b=1.0$ の場合（図6のC4）

【0040】実施例1では $0.0511 \cdot r + 0.5820 \cdot g + 0.0557 \cdot b = -0.016 < 0.0$ となるため（d）と判定され式(12)より

【数20】

$$o=0.0,\ p=0.0,\ q=0.522,\ s=0.0,\ t=0.047,\ u=0.627$$

【0041】実施例2では$s_1=0.003$，$t_1=-0.011$．$u=0.773$より　＊【数21】

$$o=0.046,\ p=0.001,\ q=0.274,\ s=0.003,\ t=0.0,\ u=0.773 \tag{21}$$

【0042】この例で示したように，本発明は3角形RGBの外側の色でも3原色信号を多原色信号へ変換することができる。

【0043】以上実施例により本願発明を詳細に説明してきたが、本願発明はこれに限定されることなく，各種の変形、変更の可能なことは当業者にとり自明であろう。

【0044】

【発明の効果】本発明原色変換方法によれば、3原色方式になるカラーテレビジョン信号の色信号でxy色度図上3原色R，G及びBの3原色点が作る3角形外の色度点の色も正確に再現することができ，彩度の高い色も正しく表示され，しかもその変換方法を構成するハード構成も比較的簡単である利点を有する。

【図面の簡単な説明】

※【図1】本発明第1の実施例のハード構成例

【図2】6原色表示で色度図上領域分割の例

【図3】第1の実施例判定器1の構成例

【図4】本発明第2の実施例のハード構成例

【図5】本発明の他の実施例（4原色）の構成例

【図6】6原色表示の色度図上の具体例

【図7】色度図を用いた現行標準方式の表示

【図8】6原色表示の色度図上の例

【符号の説明】

1～5　判定器

γ　ガンマ補正

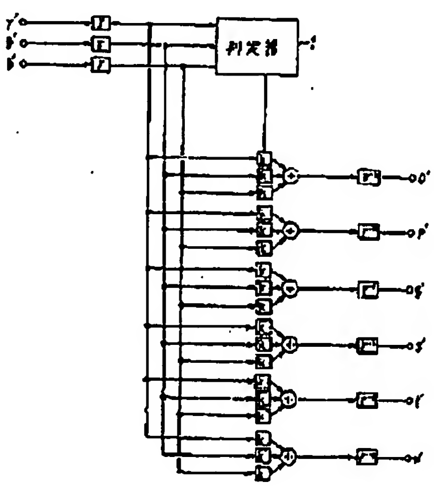
γ^{-1}　逆ガンマ補正

k　係数器

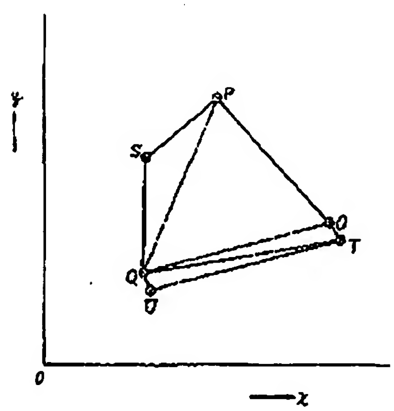
k_1～k_{12}　係数器

※N.C.　負クリップ及び反転出力

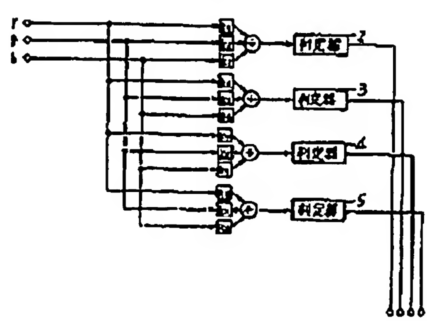
【図1】



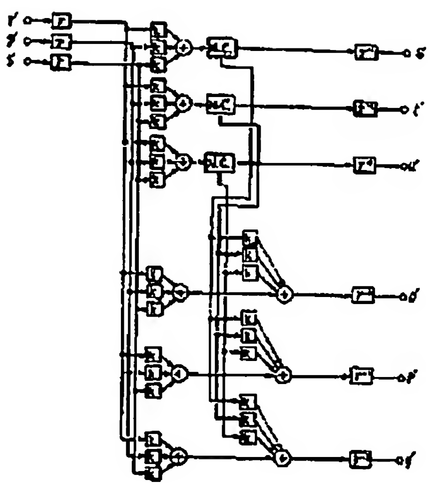
【図2】



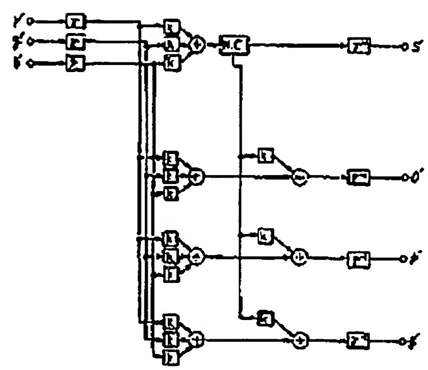
【図3】



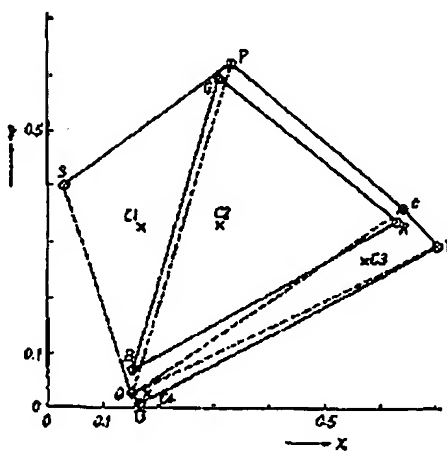
【図4】



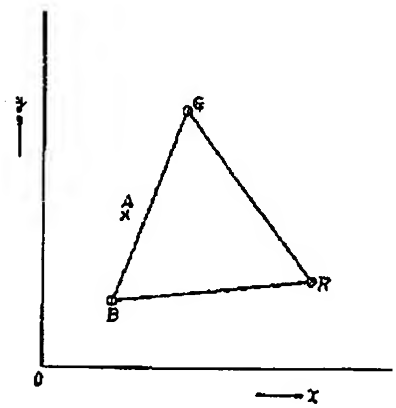
【図5】



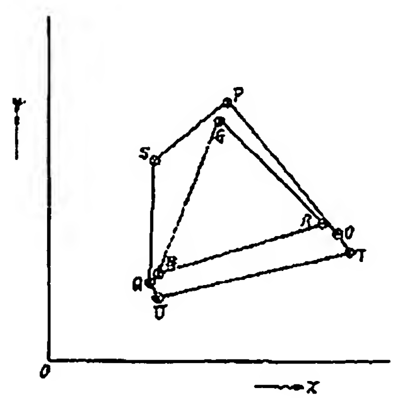
【図6】



【図7】



【図8】



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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the digital disposal circuit for displaying a television signal, and relates to the primary color conversion approach of changing into the signal for a multi-primary color display the colour television signal which becomes a three-primary-colors method using simple primary association and the clip of a negative signal especially.
[0002]
[Description of the Prior Art] In the present color-television transmission system or its display, transmission from the three primary colors or the display based on the three primary colors is put in practical use, and the conventional technique of the multi-primary color display exceeding the three primary colors did not exist.
[0003]
[Problem(s) to be Solved by the Invention] For example, the present color-television standard method consists of three primary color points (R), i.e., red, green (G), and blue (B). If these primary color points are displayed on xy chromaticity diagram, it will become like drawing 7 . The present standard method can also express the color on the outside of the 3 square shape RGB of drawing 7 , and if the signal level r, g, and b of the three-primary-colors points R, G, and B expresses the color of arbitration, Point A will be a color from which the value of r becomes negative.
[0004] However, since the luminescent color with which level is equivalent to a negative value at a receiving set side does not exist, if a three-primary-colors point is with a receiving side and a transmitting side and is equal, the color located in the outside of three square shapes like the point A on a chromaticity diagram can be reproduced correctly. The following two approaches can be considered as an approach of improving this.
(i) A color with high saturation is made into a three-primary-colors point by the receiving set side.
(ii) A color with high saturation is applied and it considers as the receiving set of many primary colors more.
When it is going to reproduce the large color range by the approach of (i), it is (ii) since it is necessary to use a color with very high saturation and the color with usually high saturation has low brightness. The approach is more advantageous practically.
[0005] Six primary color displays now like drawing 8 as an example are considered. New primary colors are O, P, Q, S, T, and U. It is because it is thought that it is easy to consider as the integral multiple of this practically to have considered six primary colors since the present display is the three primary colors. If the signal level of three-primary-colors each color is r, g, and b, respectively when the signal level of 6 primary-color each color expresses the color which are o, p, q, s, t, and u, respectively by the three-primary-colors system, as for (element, tristimulus-value) of light and a formula (1) will be materialized considering R, G, B, O, P, Q, S, T, and U as a matrix of 1x3.
[Equation 1]
$o \cdot O+p \cdot P+q \cdot Q+s \cdot S+t \cdot T+u \cdot U=r \cdot R+g \cdot G+b \cdot B$ (1)

Since equations (1) are 3 simultaneous equations, if they do not add some conditions of 6 yuan, they cannot be solved.
[0006] Then, the purpose of this invention changes the colour television signal which becomes the transmitted three-primary-colors method into the signal for a multi-primary color display, and uses as an offer plug the possible primary color conversion approach for a multi-primary color display of more specifically solving 3 simultaneous equations of 6 yuan like the above-mentioned equation (1) which can also reproduce a color with high saturation correctly.
[0007]
[Means for Solving the Problem] In order to attain the purpose, the 1st invention which becomes the primary color conversion approach for this invention multi-primary color display the luminance signal Y of a colour television signal and two color-difference signals C1 and C2 which have been transmitted Change into the three-primary-colors signals R, G, and B through a reverse matrix circuit, and it judges in what kind of location the three-primary-colors signals R, G, and B acquired by conversion are on a chromaticity diagram. Three primary colors are chosen from the many primary colors exceeding the three primary colors independently prepared on the chromaticity diagram based on the judgment result, these primary association expresses an input chrominance signal, and it is characterized by making it prepare for the multi-primary color display by the receiving side.
[0008] moreover, the luminance signal Y of a colour television signal and two color-difference signals C1 with which the 2nd invention has been transmitted And C2 Change into the three-primary-colors signals R, G, and B through a reverse matrix circuit, and calculate the many primary signals exceeding the three primary colors independently prepared on the chromaticity diagram by the receiving side as primary association of said three-primary-colors signals R, G, and B, respectively, and they are outputted. An amendment signal is prepared while making the output into zero, when three primary colors are chosen from the many primary colors exceeding said three primary colors and the output of said primary association of the other primary color becomes negative. The amendment signal is added and outputted to the output of said primary association of said three selected primary colors, and it is characterized by equipping a display with the many primary colors in a receiving side.
[0009]
[Example] With reference to an accompanying drawing, an example explains this invention to a detail below. The luminance signal Y of the colour television signal which becomes the three-primary-colors method which was transmitted first, and by which it came, and two color-difference signals C1 and C2 It is changed into the three-primary-colors signals R, G, and B by the usual reverse matrix circuit. The approach of changing a primary color point for this three-primary-colors signal between the primary color points more than the three primary colors in a receiving side for every pixel according to the color of that input is invention of the 1st of this application.
[0010] It is the 1st example which is 6 primary color displays and divided the color range into drawing 2 in the combination of the inside three primary colors to four possible fields (three square shapes OPQ, PSQ, TOQ, and TQU) of a display. for example, an input chrominance signal is in the range of chromaticity-diagram top 3 square shape OPQ -- if it becomes -- a formula (1) -- setting -- s=t=u=0.0 ** -- the time of carrying out -- o, p, and q> 0.0 ** -- since the solution to say is acquired, exact color reproduction is performed. Conversion to o, p, q, s, t, and u from r, g, and b can be carried out with the configuration of the hardware of the drawing 1 illustration.
[0011] That there is an input level of three-primary-colors R, G, and B signal with r', g', and b' by drawing 1 shows the color component of R, G, and B of the chrominance signal with which the gamma property of the display by the side of a display was amended, and it returns the amendment in the gamma property gamma, and before outputting to a display after performing primary color conversion, it is carrying out gamma property amendment. It judges in what kind of location the judgment machine 1 has the inputted chrominance signal on a chromaticity diagram, for example, xy chromaticity diagram, for example, in which field of four 3 square-shape fields shown previously is it?, and chooses whether it uses whether the group of the group (6 sets) throat of three coefficient multipliers k perpendicularly located in a line by the result of the judgment is used.

[0012] It is the formula (2) which displays the chromaticity-diagram top straight line PQ in order to investigate whether it is on the left of a straight line PQ for example, on a drawing 2 illustration xy chromaticity diagram, and whether it is in the right in which of the straight line by which the color of arbitration was given on the chromaticity diagram it is.
[Equation 2]
k1, r+k2 and g+k3, and b= 0 (2)
Twist multipliers k1, k2, and k3 It sets, and r of an input chrominance signal, g, and b component are multiplied by these multipliers, respectively, those primary association is taken, and it judges by the positive/negative as a result of association. a configuration [like drawing 3] whose hard configuration of this judgment is -- it is -- the configuration of drawing 3 -- also taking -- it does not correct but they are the contents of the drawing 1 illustration judging machine 1.
[0013] That is, they are the signal and multipliers k1, k2, and k3 which Signals r, g, and b multiplied by the gamma multiplier in drawing 3 at R of an input television signal, G, and B component, and returned. The group of a multiplier On the drawing 2 illustration chromaticity diagram, for example, the multiplication multiplier group for judging whether an input chrominance signal consists in which side to a straight line PQ, They are multipliers k4, k5, and k6 similarly. The group of a multiplier, and multipliers k7, k8, and k9 In the thing to straight lines OQ and QT, and now, the group of a multiplier will call the group which is not used the group of the multiplier of a multiplier k10, k11, and k12.
[0014] Primary association of each multiplication output of the group of these multipliers is judged by forward [the] and negative with the judgment vessels 2-5 to be 0 or 1, and these outputs operate the coefficient multiplier group k of the drawing 1 illustration, or are not operated, and carry out actuation more specifically shown in (d) from (a) below.
[0015] (a) Judging it as three square shape PSQ, when the color of an input is on the left of a straight line PQ, a coefficient multiplier k is [Equation 3].
o=t=u=0.0 p-P+q-Q+s-S=r-R+g-G+b-B (3)
It comes out and becomes the decided multiplier.
[0016] (b) The color of an input judges it as three square shape OPQ on the right of a straight line PQ at the time on a straight line OQ, and a coefficient multiplier k is [Equation 4].
s=t=u=0.0 o-O+p-P+q-Q=r-R+g-G+b-B (4)
It comes out and becomes the decided multiplier.
[0017] (c) The color of an input judges it as three square shape OQT under a straight line OQ at the time on a straight line QT, and a coefficient multiplier k is [Equation 5].
p=s=u=0.0 o-O+q-Q+t-T=r-R+g-G+b-B (5)
It comes out and becomes the decided multiplier.
[0018] (d) Judging it as three square shape TQU, when the color of an input is under a straight line QT, a coefficient multiplier k is [Equation 6].
o=p=s=0.0 t-T+q-Q+u-U=r-R+g-G+b-B (6)
It comes out and becomes the decided multiplier.
[0019] Next, the 2nd example concerning this application the 2nd invention is explained. The configuration of the 2nd example is shown in drawing 4 . In order that the 1st example may take and change a coefficient multiplier k for every pixel corresponding to the color of an input, the scale of hardware becomes large, but in drawing 4 , since the multiplier is set constant, the scale of hardware is small. Although some colors in the 6 square shape OPSQUT may not be completely reproduced with this configuration, it is completely satisfactory practically.
[0020] In this drawing, a negative clip and reversal output N.C. carry out the following work. That is, when Input x (left-hand side of drawing) is forward, "x" is outputted to right-hand side and, downward, "0" is outputted.
[0021] When Input x is negative, "0" is outputted to right-hand side and, downward, "x" is outputted.
[0022] Theoretic actuation of drawing 4 is explained below. An equation (1) can deform with an equation (7), this makes s, t, and u a dependent variable, and unknowns are 3 yuan 3 simultaneous equations of o, p, and q.

[Equation 7]
o-O+p-P+q-Q=r-R+g-G+b-B-s-S-t-T-u-U (7)
[0023] if s, t, and u are simply expressed by primary association of r, g, and b -- constraint of a formula (7) -- theoretic -- o, p, q, s, t, and u -- one of values become negative to many colors inside the 6 square shape OPSQUT which all values should be able to express by 0 or forward. Therefore, right color reproduction is not made. In drawing 4 , in order to improve this, a negative clip and reversal output N.C. are used. When s, t, and u are negative, this circuit outputs "0", adds that correction term to o, p, and q, and it can solve the above-mentioned problem sharply.
[0024] in addition, the multiplier of the coefficient multiplier k of drawing -- almost all the colors inside 6 square-shape OPSQUT -- receiving -- o, p, q, s, t, and u -- all values -- 0 -- or it is beforehand decided by count that it just becomes.
[0025] Moreover, drawing 5 shows the hard configuration at the time of applying drawing 4 to four primary colors.
[0026] Next, in order to understand the invention in this application more concretely, the numeric value on a chromaticity diagram is concretely given to R, G, B, O, P, Q, S, T, and U, and explanation of the drawing 4 illustration hard configuration is given to drawing 1 . The case of the following chromaticity points is considered as an example.
[Equation 8]
R(0.393, 0.212, 0.019),G(0.365, 0.701, 0.112), B(0.192, 0.087, 0.958),O(0.640, 0.360, 0.000), P(0.332, 0.620, 0.048),Q(0.153, 0.024, 0.823),S(0.028, 0.398, 0.574),T(0.705, 0.295, 0.000),U(0.169, 0.007, 0.824) (8)
[0027] Each primary color is displayed with the tristimulus values X, Y, and Z of a color by the formula (8), and if shown on xy chromaticity diagram, it will become like drawing 6 .
[0028] To the inputted colors r, g, and b, in the example 1 (drawing 1), a field judging is carried out as follows and signal level is calculated.
(a) -0.7949, r+0.0569, g+0.0487, and b> 0.0 It solves and is [Equation 9].
o=t=u=0.0 p= 0.9623, r+1.0837, g+0.0568, andb q= 0.6681, r+0.0226, g+1.1182, andb s=-1.0057, r+0.0719, g+0.0617, and b (9)
[0029] (b) And -0.0082-r+0.5452-g+0.0552 and b> 0.0 It solves and is [Equation 10]. -0.7949, r+0.0569, g+0.0487, and b< 0.0
s=t=u=0.0 o= 0.6182, r-0.0442, g-0.0378, and b p=-0.0173, r+1.1538, g+0.1168, and b q= 0.0238, r+0.0687, g+1.1577, andb (10) [0030] (c) And 0.0511-r+0.5820-g+0.0557 and b> 0.0 It solves and is [Equation 11]. -0.0082, r+0.5452, g+0.0552, and b< 0.0
p=s=u=0.0 o= 0.5274, r+6.0051, g+0.5745, andb q= 0.0228, r+0.1360, g+1.1645, andb t= 0.0745, r-4.9629, g-0.5023, and b (11) [0031] (d) 0.0511-r+0.5820-g+0.0557 and b< 0.0 It solves and is [Equation 12].
o=p=s=0.0q= 2.0815, r+23.579, g+3.4070, andbt= 0.5994, r+1.0138, g+0.0694, bu=-2.0562, r-23.414, b-2.2398, and b[0032] The following count is performed in the example 2 (drawing 4).
[Equation 13]
f (x) =x, x> 0.00, and x< 0.0g (x) = 0, x>0.0x, x<0.0s1 = -0.9182-r+0.0825-g+0.1979, bt1 = 0.2936-r-1.8853-g-0.3339, bu1 = [When referred to as -0.1249, r-1.3786, g+0.7049, and b] o=-0.2972, r+2.3798, g+0.4522, b-0.6147, and g (s1) + 1.2189, g(t1) +0.0547, andg (u1) p= 0.9378, r+0.5533, g-0.1118, b+0.9741, and g (s1) - 0.2325, g(t1)-0.0593, and g (u1) q= 0.7335, r+1.4264, g+0.3273, b+0.6406, andg (s1) +0.0136, g(t1) +1.0047, andg (u1) s= f (s1) t=f (t1) u= f (u1) (13) [0033] About some color samples, it explains what kind of value (9) - (13) type produces.
(e) r=-0.5, g= 1.0, and b= 1.0 In the case (C1 of drawing 6)
[0034] In an example 1 - 0.7949-r+0.0569-g+0.0487 and b= 0.503>0.0 Since it becomes, it is judged with (a), and it is [Equation 14] from a formula (9).
o= 0.0, p= 0.659, q= 0.807, s= 0.637, t= 0.0, u= 0.0 (14) [0035] At an example 2, it is s1 =0.740, t1 =-2.367, and u=-0.637. [Equation 15]
o= 0.062, p= 0.559, q= 0.741, s= 0.740, t= 0.0, u= 0.0 (15) and (f) r= 1.0, g= 1.0, and b= 1.0 In the case

(C2 of drawing 6)
[0036] At an example 1, they are -0.7949, r+0.0569, g+0.0487, and b=-0.689 <0.0-0.0082, r+0.5452-g+0.0552, and b=. 0.592 > 0.0 Since it becomes, it is judged with (b), and it is [Equation 16] from a formula (10).
o= 0.536, p= 1.253, q= 1.250, s= 0.0, t= 0.0, u= 0.0 (16) [0037] At an example 2, it is s1 =-0.638, t1 =-1.926, and u=-0.799. [Equation 17]
o= 0.536, p= 1.253, q= 1.250, s= 0.0, t= 0.0, u= 0.0 (17) and (g) r= 1.0, g=-0.05, and b= 1.0 In the case (C3 of drawing 6)
[0038] At an example 1, they are -0.0082, r+0.5452, g+0.0552, and b=-0.030 <0.00.0511-r+0.5820, g+0.0557, and b=. 0.028 > 0.0 Since it becomes, it is judged with (c), and it is [Equation 18] from a formula (11).
o= 0.285, p= 0.0, q= 0.132, s= 0.0, t= 0.272, u= 0.0 (18) [0039] At an example 2, it is s1 =-0.903, t1 =0.355, and u1 =0.015. [Equation 19]
o= 0.184, p= 0.020, q= 0.117, s= 0.0, t= 0.355, u= 0.015 (19) and (h) r= 0.2, g=-0.14, and b= 1.0 In the case (C4 of drawing 6)
[0040] At an example 1, it is 0.0511, r+0.5820, g+0.0557, and b=-0.016 <0.0. Since it becomes, it is judged with (d), and it is [Equation 20] from a formula (12).
o= 0.0, p= 0.0, q= 0.522, s= 0.0, t= 0.047, u= 0.627 (20) [0041] At an example 2, it is s1 =0.003, t1 =-0.011, and u= 0.773. [Equation 21]
o= 0.046, p= 0.001, q= 0.274, s= 0.003, t= 0.0, u= 0.773 (21) [0042] As this example showed, this invention can change a three-primary-colors signal into many primary signals also by the color of the outside of the 3 square shape RGB.
[0043] Although the example has explained the invention in this application to the detail above, probably, the possible thing of the invention in this application of various kinds of deformation and modification will be obvious for this contractor, without being limited to this.
[0044]
[Effect of the Invention] According to this invention primary color conversion approach, the color of the chromaticity point besides 3 square shapes which the three-primary-colors point of xy chromaticity-diagram top three-primary-colors R, and G and B makes with the chrominance signal of the colour television signal which becomes a three-primary-colors method is also correctly reproducible, and a color with high saturation is also displayed correctly and it has an advantage also with the comparatively easy hard configuration which moreover constitutes the conversion approach.

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[Item(s) to be Amended] Whole sentence
[Method of Amendment] Modification
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[Document Name] Specification
[Title of the Invention] The primary color conversion approach for a multi-primary color display, and equipment
[Claim(s)]
[Claim 1] the luminance signal Y of a colour television signal and two color-difference signals C1 which have been transmitted And C2 Change into the three-primary-colors signals R, G, and B through a reverse matrix circuit, and it judges in what kind of location the input three-primary-colors signals R, G, and B acquired by conversion are on a chromaticity diagram. The primary color conversion approach for a multi-primary color display characterized by choosing three primary colors from the many primary colors exceeding the three primary colors independently prepared on the chromaticity diagram based on the judgment result, and these primary association expressing an input chrominance signal, and making it prepare for the multi-primary color display by the receiving side.
[Claim 2] the luminance signal Y of a colour television signal and two color-difference signals C1 which have been transmitted And C2 Change into the three-primary-colors signals R, G, and B through a reverse matrix circuit, and calculate the many primary signals exceeding the three primary colors independently prepared on the chromaticity diagram by the receiving side as primary association of said

three-primary-colors signals R, G, and B, respectively, and they are outputted. An amendment signal is prepared while making the output into zero, when three primary colors are chosen from the many primary colors exceeding said three primary colors and the output of said primary association of the other primary color becomes negative. The primary color conversion approach for a multi-primary color display characterized by adding the amendment signal to the output of said primary association of said three selected primary colors, outputting, and making it prepare for the multi-primary color display by the receiving side.

[Claim 3] the primary color conversion approach for a multi-primary color display according to claim 1 or 2 characterized by coming for primary color conversion up the point, carrying out the gamma correction of the three-primary-colors signals R, G, and B, respectively, and carrying out the reverse gamma correction of the output many primary signals when the gamma correction of a receiving-side display is seen, said colour television signal is crowded, and a reverse gamma correction is carried out and it is transmitted.

[Claim 4] the luminance signal Y of a colour television signal and two color-difference signals C1 which have been transmitted And C2 the three primary colors of a basis -- reverse matrix circuit which carries out inverse transformation to R, G, and B signal,

It is said primary three-primary-colors primary signal [which calculates as primary association of R, G, and B signal, and is outputted / multi-] joint count circuit about each of the many primary signals which exceed the three primary colors independently prepared on the chromaticity diagram in order to enable reappearance also of a color with more high saturation correctly by the receiving side,

The chromaticity-diagram top location judging circuit which judges in what kind of location input three-primary-colors R obtained by said reverse matrix circuit, G, and B signal are on said chromaticity diagram,

Three primary color selection circuits which select three primary colors from the many primary colors exceeding the three primary colors independently prepared on said chromaticity diagram based on this judgment circuit,

The output circuit which extracts only a primary joint result with said three-primary-colors [of said said three selected primary colors] R, G, and B signal from the output of said primary multi-primary signal joint count circuit, and outputs it in order to prepare for the multi-primary color display by the receiving side,

******** -- the primary color inverter for a multi-primary color display characterized by things.

[Claim 5] the luminance signal Y of a colour television signal and two color-difference signals C1 which have been transmitted And C2 the three primary colors of a basis -- reverse matrix circuit which carries out inverse transformation to R, G, and B signal,

It is said primary three-primary-colors primary signal [which calculates as primary association of R, G, and B signal, and is outputted / multi-] joint count circuit about each of the many primary signals which exceed the three primary colors independently prepared on the chromaticity diagram in order to enable reappearance also of a color with more high saturation correctly by the receiving side,

The amendment circuit which prepares an amendment signal while making the output into zero, when the output of primary association for which chose three primary colors from the many primary colors exceeding said three primary colors, and it asked in said primary multi-primary signal joint count circuit of the other primary color becomes negative,

The output circuit which adds and outputs said prepared amendment signal to the output of primary association for which it asked in said primary multi-primary signal joint count circuit of said three selected primary colors in order to prepare for the multi-primary color display by the receiving side,

******** -- the primary color inverter for a multi-primary color display characterized by things.

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the digital disposal circuit for displaying a television signal, and relates to the primary color conversion approach and equipment which change into the signal for a multi-primary color display the colour television signal which becomes a three-primary-colors

method using simple primary association and the clip of a negative signal especially.
[0002]
[Description of the Prior Art] In the present color-television transmission system or its display, transmission from the three primary colors or the display based on the three primary colors is put in practical use, and the conventional technique of the multi-primary color display exceeding the three primary colors did not exist.
[0003]
[Problem(s) to be Solved by the Invention] For example, the present color-television standard method consists of three primary color points (R), i.e., red, green (G), and blue (B). If these primary color points are displayed on xy chromaticity diagram, it will become like drawing 7. The present standard method can also express the color on the outside of the 3 square shape RGB of drawing 7, and if the signal level r, g, and b of the three-primary-colors points R, G, and B expresses the color of arbitration, Point A will be a color from which the value of r becomes negative.
[0004] However, since the luminescent color with which level is equivalent to a negative value at a receiving set side does not exist, if a three-primary-colors point is with a receiving side and a transmitting side and is equal, the color located in the outside of three square shapes like the point A on a chromaticity diagram can be reproduced correctly. The following two approaches can be considered as an approach of improving this.
(i) A color with high saturation is made into a three-primary-colors point by the receiving set side.
(ii) A color with high saturation is applied and it considers as the receiving set of many primary colors more.
When it is going to reproduce the large color range by the approach of (i), it is (ii) since it is necessary to use a color with very high saturation and the color with usually high saturation has low brightness. The approach is more advantageous practically.
[0005] Six primary color displays now like drawing 8 as an example are considered. New primary colors are O, P, Q, S, T, and U. It is because it is thought that it is easy to consider as the integral multiple of this practically to have considered six primary colors since the present display is the three primary colors. If the signal level of three-primary-colors each color is r, g, and b, respectively when the signal level of 6 primary-color each color expresses the color which are o, p, q, s, t, and u, respectively by the three-primary-colors system, as for (element, tristimulus-value) of light and a formula (1) will be materialized considering R, G, B, O, P, Q, S, T, and U as a matrix of 1x3.
[Equation 1]
o-O+p-P+q-Q+s-S+t-T+u-U
= r-R+g-G+b-B (1)
Since equations (1) are 3 simultaneous equations, if they do not add some conditions of 6 yuan, they cannot be solved.
[0006] Then, the purpose of this invention changes the colour television signal which becomes the transmitted three-primary-colors method into the signal for a multi-primary color display, and uses as an offer plug the possible primary color conversion approach for a multi-primary color display and the equipment of more specifically solving 3 simultaneous equations of 6 yuan like the above-mentioned equation (1) which can also reproduce a color with high saturation correctly.
[0007]
[Means for Solving the Problem] In order to attain the purpose, the 1st invention which becomes the primary color conversion approach for this invention multi-primary color display the luminance signal Y of a colour television signal and two color-difference signals C1 and C2 which have been transmitted Change into the three-primary-colors signals R, G, and B through a reverse matrix circuit, and it judges in what kind of location the input three-primary-colors signals R, G, and B acquired by conversion are on a chromaticity diagram. Three primary colors are chosen from the many primary colors exceeding the three primary colors independently prepared on the chromaticity diagram based on the judgment result, these primary association expresses an input chrominance signal, and it is characterized by making it prepare for the multi-primary color display by the receiving side.

[0008] moreover, the luminance signal Y of a colour television signal and two color-difference signals C1 with which invention of the 2nd of the primary color conversion approach has been transmitted And C2 Change into the three-primary-colors signals R, G, and B through a reverse matrix circuit, and calculate the many primary signals exceeding the three primary colors independently prepared on the chromaticity diagram by the receiving side as primary association of said three-primary-colors signals R, G, and B, respectively, and they are outputted. An amendment signal is prepared while making the output into zero, when three primary colors are chosen from the many primary colors exceeding said three primary colors and the output of said primary association of the other primary color becomes negative. The amendment signal is added to the output of said primary association of said three selected primary colors, and it outputs, and is characterized by making it prepare for the display of the many primary colors in a receiving side.

[0009] Furthermore, 1st invention which becomes a primary color inverter for this invention multi-primary color display is characterized by having the following. the luminance signal Y of a colour television signal and two color-difference signals C1 which have been transmitted And C2 the three primary colors of a basis -- reverse matrix circuit which carries out inverse transformation to R, G, and B signal It is said primary three-primary-colors primary signal [which calculates as primary association of R, G, and B signal, and is outputted / multi-] joint count circuit about each of the many primary signals which exceed the three primary colors independently prepared on the chromaticity diagram in order to enable reappearance also of a color with more high saturation correctly by the receiving side. The chromaticity-diagram top location judging circuit which judges in what kind of location input three-primary-colors R obtained by said reverse matrix circuit, G, and B signal are on said chromaticity diagram, In order to prepare for three primary color selection circuits which select three primary colors from the many primary colors exceeding the three primary colors independently prepared on said chromaticity diagram based on this judgment circuit, and the multi-primary color display by the receiving side, The output circuit which extracts only a primary joint result with said three-primary-colors [of said said three selected primary colors] R, G, and B signal from the output of said primary multi-primary signal joint count circuit, and outputs it

[0010] Moreover, invention of the 2nd of the primary color inverter is characterized by having the following. the luminance signal Y of a colour television signal and two color-difference signals C1 which have been transmitted And C2 the three primary colors of a basis -- reverse matrix circuit which carries out inverse transformation to R, G, and B signal It is said primary three-primary-colors primary signal [which calculates as primary association of R, G, and B signal, and is outputted / multi-] joint count circuit about each of the many primary signals which exceed the three primary colors independently prepared on the chromaticity diagram in order to enable reappearance also of a color with more high saturation correctly by the receiving side. The amendment circuit which prepares an amendment signal while making the output into zero, when the output of primary association for which chose three primary colors from the many primary colors exceeding said three primary colors, and it asked in said primary multi-primary signal joint count circuit of the other primary color becomes negative, The output circuit which adds and outputs said prepared amendment signal to the output of primary association for which it asked in said primary multi-primary signal joint count circuit of said three selected primary colors in order to prepare for the multi-primary color display by the receiving side

[0011]

[Example] With reference to an accompanying drawing, an example explains this invention to a detail below. The luminance signal Y of the colour television signal which becomes the three-primary-colors method which was transmitted first, and by which it came, and two color-difference signals C1 and C2 It is changed into the three-primary-colors signals R, G, and B by the usual reverse matrix circuit. The approach and equipment which change a primary color point for this three-primary-colors signal between the primary color points more than the three primary colors in a receiving side for every pixel according to the color of that input are invention of the 1st of this application.

[0012] Drawing 2 is 6 primary color displays, and is the 1st example which divided the color range into

four possible fields (three square shapes OPQ, PSQ, TOQ, and TQU) of a display in the combination of the inside three primary colors. for example, an input chrominance signal is in the range of chromaticity-diagram top 3 square shape OPQ -- if it becomes -- a formula (1) -- setting -- s=t=u=0.0 ** -- the time of carrying out -- o, p, and q> 0.0 ** -- since the solution to say is acquired, exact color reproduction is performed. Conversion to o, p, q, s, t, and u from r, g, and b can be carried out with the configuration of the hardware of the drawing 1 illustration.

[0013] That there is an input level of three-primary-colors R, G, and B signal with r', g', and b' by drawing 1 shows the color component of R, G, and B of the chrominance signal with which the gamma property of the display by the side of a display was amended, and it returns the amendment in the gamma property gamma, and before outputting to a display after performing primary color conversion, it is carrying out gamma property amendment. It judges in what kind of location the judgment machine 1 has the inputted chrominance signal on a chromaticity diagram, for example, xy chromaticity diagram, for example, in which field of four 3 square-shape fields shown previously is it?, and chooses whether it uses whether the group of the group (6 sets) throat of three coefficient multipliers k perpendicularly located in a line by the result of the judgment is used.

[0014] It is the formula (2) which displays the chromaticity-diagram top straight line PQ in order to investigate whether it is on the left of a straight line PQ for example, on a drawing 2 illustration xy chromaticity diagram, and whether it is in the right in which of the straight line by which the color of arbitration was given on the chromaticity diagram it is.

[Equation 2]

k1, r+k2 and g+k3, and b= 0 (2)

Twist multipliers k1, k2, and k3 It sets, and r of an input chrominance signal, g, and b component are multiplied by these multipliers, respectively, those primary association is taken, and it judges by the positive/negative as a result of association. a configuration [like drawing 3] whose hard configuration of this judgment is -- it is -- the configuration of drawing 3 -- also taking -- it does not correct but they are the contents of the drawing 1 illustration judging machine 1.

[0015] That is, they are the signal and multipliers k1, k2, and k3 which Signals r, g, and b multiplied by the gamma multiplier in drawing 3 at R of an input television signal, G, and B component, and returned. Group of a multiplier, On the drawing 2 illustration chromaticity diagram, for example, the multiplication multiplier group for judging whether an input chrominance signal consists in which side to a straight line PQ, They are multipliers k4, k5, and k6 similarly. The group of a multiplier, and multipliers k7, k8, and k9 In the thing to straight lines OQ and QT, and now, the group of a multiplier will call the group which is not used the group of the multiplier of a multiplier k10, k11, and k12.

[0016] Primary association of each multiplication output of the group of these multipliers is judged by forward [the] and negative with the judgment vessels 2-5 to be 0 or 1, and these outputs operate the coefficient multiplier group k of the drawing 1 illustration, or are not operated, and carry out actuation more specifically shown in (d) from (a) below.

[0017] (a) When the color of an input is on the left of a straight line PQ

It is judged as three square shape PSQ, and is a coefficient multiplier k.

[Equation 3]

o=t=u=0.0

p-P+q-Q+s-S=r-R+g-G+b-B (3)

It comes out and becomes the decided multiplier.

[0018] (b) The color of an input is on the right of a straight line PQ at the time on a straight line OQ.

It is judged as three square shape OPQ, and is a coefficient multiplier k.

[Equation 4]

s=t=u=0.0

o-O+p-P+q-Q=r-R+g-G+b-B (4)

It comes out and becomes the decided multiplier.

[0019] (c) The color of an input is under a straight line OQ at the time on a straight line QT.

It is judged as three square shape OQT, and is a coefficient multiplier k.

[Equation 5]
p=s=u=0.0
o-O+q-Q+t-T=r-R+g-G+b-B (5)
It comes out and becomes the decided multiplier.
[0020] (d) When the color of an input is under a straight line QT
It is judged as three square shape TQU, and is a coefficient multiplier k.
[Equation 6]
o=p=s=0.0
t-T+q-Q+u-U=r-R+g-G+b-B (6)
It comes out and becomes the decided multiplier.
[0021] Next, the 2nd example concerning this application the 2nd invention is explained. The configuration of the 2nd example is shown in drawing 4. In order that the 1st example may take and change a coefficient multiplier k for every pixel corresponding to the color of an input, the scale of hardware becomes large, but in drawing 4, since the multiplier is set constant, the scale of hardware is small. Although some colors in the 6 square shape OPSQUT may not be completely reproduced with this configuration, it is completely satisfactory practically.
[0022] In this drawing, a negative clip and reversal output N.C. carry out the following work. That is, when Input x (left-hand side of drawing) is forward, "x" is outputted to right-hand side and, downward, "0" is outputted.
When Input x is negative, "0" is outputted to right-hand side and, downward, "x" is outputted.
[0023] Theoretic actuation of drawing 4 is explained below. An equation (1) can deform with an equation (7), this makes s, t, and u a dependent variable, and unknowns are 3 yuan 3 simultaneous equations of o, p, and q.
[Equation 7]
o-O+p-P+q-Q=r-R+g-G+b-B-s-S-t-T-u-U
(7)
[0024] if s, t, and u are simply expressed by primary association of r, g, and b -- constraint of a formula (7) -- theoretic -- o, p, q, s, t, and u -- one of values become negative to many colors inside the 6 square shape OPSQUT which all values should be able to express by 0 or forward. Therefore, right color reproduction is not made. In drawing 4, in order to improve this, a negative clip and reversal output N.C. are used. When s, t, and u are negative, this circuit outputs "0", adds that correction term to o, p, and q, and it can solve the above-mentioned problem sharply.
[0025] in addition, the multiplier of the coefficient multiplier k of drawing -- almost all the colors inside 6 square-shape OPSQUT -- receiving -- o, p, q, s, t, and u -- all values -- 0 -- or it is beforehand decided by count that it just becomes. Moreover, drawing 5 shows the hard configuration at the time of applying drawing 4 to four primary colors.
[0026] Next, in order to understand the invention in this application more concretely, the numeric value on a chromaticity diagram is concretely given to R, G, B, O, P, Q, S, T, and U, and explanation of the drawing 4 illustration hard configuration is given to drawing 1. The case of the following chromaticity points is considered as an example.
[Equation 8]
R(0.393, 0.212, 0.019),G(0.365, 0.701, 0.112),B(0.192, 0.087, 0.958),
O(0.640, 0.360, 0.000),P(0.332, 0.620, 0.048),Q(0.153, 0.024, 0.823),
S(0.028, 0.398, 0.574),T(0.705, 0.295, 0.000),U(0.169, 0.007, 0.824)
(8)
[0027] Each primary color is displayed with the tristimulus values X, Y, and Z of a color by the formula (8), and if shown on xy chromaticity diagram, it will become like drawing 6.
[0028] To the inputted colors r, g, and b, in the example 1 (drawing 1), a field judging is carried out as follows and signal level is calculated.
(a) -0.7949, r+0.0569, g+0.0487, and b> 0.0 At the time
[Equation 9]

o=t=u=0.0
p= 0.9623, r+1.0837, g+0.0568, andb
q= 0.6681, r+0.0226, g+1.1182, andb
s=-1.0057, r+0.0719, g+0.0617, and b (9)
[0029]
(b) -0.7949, r+0.0569, g+0.0487, and b< 0.0 And
- 0.0082-r+0.5452-g+0.0552 and b> 0.0 At the time
[Equation 10]
s=t=u=0.0
o= 0.6182, r-0.0442, g-0.0378, and b
p=-0.0173, r+1.1538, g+0.1168, and b
q= 0.0238, r+0.0687, g+1.1577, andb (10)
[0030]
(c) -0.0082, r+0.5452, g+0.0552, and b< 0.0 And
0.0511-r+0.5820-g+0.0557 and b> 0.0 At the time
[Equation 11]
p=s=u=0.0
o= 0.5274, r+6.0051, g+0.5745, andb
q= 0.0228, r+0.1360, g+1.1645, andb
t= 0.0745, r-4.9629, g-0.5023, and b (11)
[0031]
(d) 0.0511-r+0.5820-g+0.0557 and b< 0.0 At the time
[Equation 12]
o=p=s=0.0
q= 2.0815, r+23.579, g+3.4070, andb
t= 0.5994, r+1.0138, g+0.0694, andb
u=-2.0562, r-23.414, b-2.2398, and b (12)
[0032] The following count is performed in the example 2 (drawing 4).
[Equation 13]
f(x) =x,x>0.0
0,x<0.0
g(x) =0,x>0.0
x,x<0.0
s1 = -0.9182, r+0.0825, g+0.1979, and b
t1 = 0.2936, r-1.8853, g-0.3339, and b
u1 = -0.1249, r-1.3786, g+0.7049, and b
When it carries out
o=-0.2972, r+2.3798, g+0.4522, b-0.6147, and g (s1)
+ 1.2189, g(t1) +0.0547, andg (u1)
p= 0.9378, r+0.5533, g-0.1118, b+0.9741, and g (s1)
- 0.2325, g(t1)-0.0593, and g (u1)
q= 0.7335, r+1.4264, g+0.3273, b+0.6406, andg (s1)
+ 0.0136, g(t1) +1.0047, andg (u1)
s= f(s1)
t= f(t1)
u= f(u1) (13)
[0033] About some color samples, it explains what kind of value (9) - (13) type produces.
(e) r=-0.5, g= 1.0, and b= 1.0 In the case (C1 of drawing 6)
[0034] In an example 1
- 0.7949-r+0.0569-g+0.0487 and b= 0.503>0.0 Since it becomes, it is judged with (a), and it is from a formula (9).

[Equation 14]
o=0.0 ,p=0.659 ,q=0.807 ,s=0.637 ,t=0.0 ,u=0.0
(14)
[0035] In an example 2
s1 =0.740, t1 =-2.367, and u=-0.637 More
[Equation 15]
o=0.062 ,p=0.559 ,q=0.741 ,s=0.740 ,t=0.0 ,u=0.0
(15)
(f) r= 1.0, g= 1.0, and b= 1.0 In the case (C2 of drawing 6)
[0036] In an example 1
- 0.7949, r+0.0569, g+0.0487, and b=-0.689 <0.0
- 0.0082-r+0.5452-g+0.0552, b= 0.592 > 0.0 Since it becomes, it is judged with (b), and it is from a formula (10).
[Equation 16]
o=0.536 ,p=1.253 ,q=1.250 ,s=0.0 ,t=0.0 ,u=0.0
(16)
[0037] In an example 2
s1 =-0.638, t1 =-1.926, and u=-0.799 More
[Equation 17]
o=0.536 ,p=1.253 ,q=1.250 ,s=0.0 ,t=0.0 ,u=0.0
(17)
(g) r= 1.0, g=-0.05, and b= 1.0 In the case (C3 of drawing 6)
[0038] In an example 1
- 0.0082, r+0.5452, g+0.0552, and b=-0.030 <0.0
0.0511-r+0.5820-g+0.0557, b= 0.028 > 0.0 Since it becomes, it is judged with (c), and it is from a formula (11).
[Equation 18]
o=0.285 ,p=0.0 ,q=0.132 ,s=0.0 ,t=0.272 ,u=0.0
(18)
[0039] In an example 2
s1 =-0.903, t1 =0.355, and u1 =0.015 More
[Equation 19]
o=0.184 ,p=0.020 ,q=0.117 ,s=0.0 ,t=0.355 ,u=0.015
(19)
(h) r= 0.2, g=-0.14, and b= 1.0 In the case (C4 of drawing 6)
[0040] In an example 1
0.0511, r+0.5820, g+0.0557, and b=-0.016 <0.0 Since it becomes, it is judged with (d), and it is from a formula (12).
[Equation 20]
o=0.0 ,p=0.0 ,q=0.522 ,s=0.0 ,t=0.047 ,u=0.627
(20)
[0041] In an example 2
s1 =0.003, t1 =-0.011, and u= 0.773 More
[Equation 21]
o=0.046 ,p=0.001 ,q=0.274 ,s=0.003 ,t=0.0 ,u=0.773
(21)
[0042] As this example showed, this invention can change a three-primary-colors signal into many primary signals also by the color of the outside of the 3 square shape RGB.
[0043] Although the example has explained the invention in this application to the detail above, probably, the possible thing of the invention in this application of various kinds of deformation and modification will be obvious for this contractor, without being limited to this.

[0044]
[Effect of the Invention] According to this invention primary color conversion approach, the color of the chromaticity point besides 3 square shapes which the three-primary-colors point of xy chromaticity-diagram top three-primary-colors R, and G and B makes with the chrominance signal of the colour television signal which becomes a three-primary-colors method is also correctly reproducible, and a color with high saturation is also displayed correctly and it has an advantage also with the comparatively easy hard configuration which moreover constitutes the conversion approach.
[Brief Description of the Drawings]
[Drawing 1] The example of a hard configuration of the 1st example of this invention
[Drawing 2] It is the example of chromaticity-diagram top field division by 6 primary color displays.
[Drawing 3] The example of a configuration of the 1st example judging machine 1
[Drawing 4] The example of a hard configuration of the 2nd example of this invention
[Drawing 5] The example of a configuration of other examples (four primary colors) of this invention
[Drawing 6] The example on the chromaticity diagram of 6 primary color displays
[Drawing 7] The display of the present standard method using a chromaticity diagram
[Drawing 8] The example on the chromaticity diagram of 6 primary color displays
[Description of Notations]
1-5 Judgment machine
gamma Gamma correction
gamma-1 Reverse gamma correction
k Coefficient multiplier
k1 -k12 Coefficient multiplier
N.C. A negative clip and a reversal output

[Translation done.]